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Effect of Enteral Nutrition in Child Surgical Cases

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ABSTRACT

This study aims to determine the effect of enteral nutrition in pediatric surgical cases while data collection was carried out on several relevant literature studies using databases, Pubmed journals and Google Scholar, the results showed that enteral nutrition in the postoperative period should be carried out regularly. adequate through the process of excessive body muscle proteolysis and at an advanced stage. Energy expenditure will also increase in surgical trauma as a result of hormonal responses, this situation is in anticipation of early nutrition by means of enteral nutrition which will lead to faster recovery and wound healing and prevent complications so that the patient's length of stay will be shorter and indirectly will also reduce the costs incurred for the treatment of patients. Enteral nutrition in children is acceptable, tolerated, and provides a good response to nutritional status with such good acceptance of enteral nutrition that nutritional support aimed at achieving or at least maintaining optimal nutritional status can be implemented because there is less food left, so that Enteral nutrition can be used as an alternative to good nutritional support for children, this process also becomes a reference for the increased serum albumin and prealbumin values in most subjects and no weight loss occurs.

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1. Introduction

Medical science and technology in the field of surgery in the world continues to progress and causes the deepening of the deepening of the surgical branch of science to become more specific, one of which is about pediatric surgery. The field of pediatric surgery is currently developing very rapidly in advancing knowledge about embryology, growth and development, fluids, and nutrition, pediatric surgery is a surgical subspecialty that involves surgery on fetuses, infants, children, and adolescents aged 0 to 18 years in accordance with According to the provisions of the World Health Organization, the services provided in pediatric surgery have become more specific, including treating disorders of the gastrointestinal tract, such as hernia and achalasia, pyloric stenosis, intestinal obstruction, intussusception, ileus, appendicitis (appendicitis), peritonitis. , gastric perforation, gastroschisis, Hirschsprung's disease, Meckel's diverticulum, and blunt abdominal trauma (abdominal injury) (Bektiwibowo et al., 2016).

In addition, pediatric surgeons also have surgical skills in liver, biliary and pancreatic diseases, such as cholecystitis, bile cysts, biliary atresia, pancreatic pseudocysts, pancreatitis, and liver cancer. For disorders of the reproductive system, such as ovarian tumors, ovarian cysts, testicular tumors, testicular adesensus, disorders of the chest cavity and disorders of the respiratory tract, such as chest injuries, pneumothorax, hematothorax, pectus excavatum and pectus carinatum, and tumors in the chest cavity. However, more specifically, pediatric surgeons are divided into several skills, namely (1) Prenatal pediatric surgeon who treats or deals with fetuses in the womb (2) Neonatal pediatric surgeon who focuses on newborns, either term or full term. who are premature (3) Pediatric surgeon in oncology, which focuses on treating children with cancer (4) Pediatric

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surgeon in traumatology, who deals with surgical emergency care for trauma or injury cases.

In the medical world, pediatric surgeons play a role in providing health services with special competencies based on medical science, clinical skills, and the management of health problems. Meanwhile, based on the regulations of the Indonesian Medical Council (KKI) regarding professional education standards and competence of pediatric surgeons, a pediatric surgeon must have the ability to perform services, management procedures, and manage health problems in the field of pediatric surgery as a whole, and the following are his duties: and the role of a pediatric surgeon includes, determining a diagnosis based on a physical examination, medical interview, and supporting examination, having the ability to provide a correct, clear, complete, and honest explanation about the goals, needs, as well as the benefits and risks of the medical procedure to be carried out, carrying out pediatric surgical clinical procedures according to their diagnosis, needs, and authority, perform emergency medical procedures according to the patient's health problems and their authority as pediatric surgeons and finally manage pediatric surgical patients in polyclinics, operating rooms, treatment wards, intensive care units (ICU), and installation emergency department according to established management procedures (Cahyo et al., 2021).

Currently, the number of pediatric surgeons throughout Indonesia is only around 83 people to serve around 220 million Indonesians. If you look at the current comparison of the number of pediatric surgeons in Indonesia, a pediatric surgeon has to serve around 2,650,000 people every year. when compared to several neighboring countries such as Singapore, Taiwan and Hong Kong, on average a pediatric surgeon only serves 400,000 residents annually, then another problem concerning the pediatric surgical system in Indonesia is the spread of pediatric surgeon specialists in Indonesia which is still not evenly distributed in each area, it is certainly very difficult for patients to obtain maximum service.

Considering the role of pediatric surgeons who are increasingly needed every year, it is also necessary to update the methods and ways of thinking of pediatric surgeons based on basic sciences related to the pathophysiology of surgical diseases in fetuses, infants and children. This way of thinking is very important considering that in the future there will be a great need for pediatric surgeons who study certain subspecialties in the field of pediatric surgery. In this regard, the Indonesian Medical Collegium Council (MKKI) has ratified the formation of the Indonesian Pediatric Collegium of Surgery with a decree number 011/S.Kep/MKKI/IX/2004 and as a follow-up, pediatric surgery specialist study programs will be opened in several Faculties of Medicine. meet the requirements set by the government (Dewi & Supriatna, 2021).

In fact, surgical procedures for children and adults do have very different criteria, generally after a surgical procedure on children is performed, doctors will advise the patient to take a lot of rest first, considering the postoperative risks that require further supervision and procedures. Some of the complaints that are often experienced by patients after a surgical operation are incision scars and swelling of the skin and red skin color in the area around the incision. Pediatric surgical procedures also use anesthesia which can cause complaints in the form of nausea, dry mouth, sore throat, drowsiness, shortness of breath, and vomiting.

Postoperative wound healing is strongly influenced by the supply of oxygen and nutrients to the body's tissues, nutritional status in a person is the main factor that affects the growth process and maintains body tissues to stay healthy. Enteral nutrition is a therapy for providing nutrition through the digestive tract using a special tube. The way of administration can be through the nose, stomach or nose-intestine. Enteral nutrition can also be given by means of a bolus or by infusion via an enteral infusion pump. Enteral nutrition is given to patients who require nutritional intake with a digestive tract that is still functioning properly. Provision of diet with enteral nutrition to patients is given if there is a decreased level of consciousness, unable to feed themselves, or the risk of aspiration due to dysphagia that prevents adequate oral nutrition, malnutrition, gastrointestinal disorders and others (Hasir, 2013).

The provision of this nutrition can simply be explained that enteral nutrition is given to patients with indications of not being able to eat, not eating enough, or not eating. There are several things that determine the success of enteral nutrition, namely airway protection to minimize the risk of aspiration, good gastrointestinal ability to avoid slow digestion of food that can cause vomiting. Almost all postoperative patients experience anorexia or inability to eat due to loss of consciousness, sedation, and intubation. Patients who are unable to eat or are not allowed to eat must continue to receive nutrition through enteral or feeding through the gastrointestinal tract with

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a nasogastric tube (NGT) or an oral gastric tube (OGT). Enteral feeding includes swallowing solid and liquid foods orally and introducing nutrients directly into the digestive tract using a feeding tube. So based on the description and explanation of the background above, the researcher is interested in knowing more about the effectiveness of enteral nutrition in patients undergoing pediatric surgery.

2. Methods

The study was carried out by conducting a relevant review of 19 previous research results published from 2005-2021, the process was obtained using databases such as databases, Pubmed journals and Google Scholar through the keywords enteral nutrition, continuous feeding and pediatric surgery. Then the literature is limited to full text articles and journal articles only, the results are successively found several literatures that are closest to the focus of the problem that the researcher is looking for, and the literature that is most appropriate to the topic is selected regardless of the method or type of literature research. The search results in the database using Google Scholar found 30 articles, after that the researchers did a duplication check so that only 20 articles remained, the article analysis focused on the method of providing enteral nutrition with outcomes for pediatric surgical cases, the selection process was carried out through title and abstract screening so that 19 relevant articles were found. Then an assessment of the feasibility of the article was carried out by reading the full-text and sorting the articles according to the focus and objectives of the literature review, the results obtained 9 articles that were relevant and qualified, extracted using design, sample, instrument and analysis methods (Hendarto & Nasar, 2016).

TABLE 1.
RESEARCH ON THE NUTRITIONAL STATUS OF ENTERAL NUTRITION

Researcher	Results
Supriyadi Bektiwibowo, Zakiudin Munasir, Sri Sudaryati Nasar, (2005)	The enteral nutrition administered was well received by 18 of the 20 subjects and well tolerated by all subjects. None of the subjects experienced weight loss. There was an increase in the mean weight of 130 + 100 g, an increase in the mean value of albumin by 0.16 + 0.35 g/dl, and an increase in the mean value of prealbumin by 2.37 + 3.88 mg/dl.
Rizky Putri Aushiva, (2013)	The highest wound healing was 66.7%, normal nutritional status was 51.5%, the age of patients in the 0-3 year age group was 39.4%.
Paridah, (2014)	The nutritional status of postoperative patients was mostly good (59.6%). Most of the wound healing patients after surgery were dry (65.4%).
Irene Yuniar, Abdul Latief, Yoga Devaera, Suci Fitrianti, (2014)	41.3% of patients received nutrition. Underfeeding occurs in the provision of calories, protein, and fat.
Abadi, (2017)	Vitamin C is required for the formation of collagen. The need for vitamin C for wound healing ranges from 500-1000 mg/day. Therefore, the earlier it is fulfilled and the adequate intake of nutrients, the faster and optimal wound healing speed.
Rennita Hutagaol, Nizar Syarif Hamidi, (2020)	The intermittent feeding method of enteral nutrition was more effective than the gravity drip method in critically ill patients with p = 0.000. It was found that the average gastric residue with the intermittent feeding method was 16.02, with a standard deviation of 12,593, while the average gravity drip method was 171.13 with a standard deviation of 95,337.
Taweegan, P., Reungjui, (2020).	The right time to start oral nutrition if early nutrition is applied to minimize malnutrition is 4 hours after surgery.
Njoo, yuliana dewi, (2021)	Infants who received enteral protein of 3.5 – 4.5 g/kg/day gained weight. Administration of docosahexaenoic acid (DHA), a mixture of DHA & arachidonic acid (AA), calcium, phosphorus, and vitamin D did not significantly affect growth. In contrast, enteral zinc intake had a positive correlation with weight gain. Dual strain probiotics, Bifidobacterium & Clostridium butyricum have been shown to increase the daily weight of babies. Lactobacillus reuteri is a probiotic that can increase the frequency of daily bowel movements, increase the results of body weight, body length, and head circumference, thereby shortening the hospital stay.

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Researcher	Results
Qonita Rachmah, Endah Sarworini, (2021)	The results of the biochemical laboratory of RBC, WBC, HGB, HCT, and albumin showed a decrease and an increase towards normal values, the patient's intake increased from day to day, but could not reach the target (<60%).

3. Results and Discussion

Malnutrition is a common problem in most patients admitted to the hospital, including disorders caused by nutritional deficiencies, impaired nutrient metabolism or nutritional excess. Malnutrition is often associated with complications that occur during surgery, although it is still difficult to state the causal relationship, it is known that malnutrition can inhibit surgical wound healing, body resistance (immunocompetence), decreased heart and respiratory muscle function, furthermore, malnourished patients will have a higher risk. higher morbidity is proportional to a longer length of stay, when compared to well-nourished patients (Kadim & Sutantio, 2019).

Malnutrition is also associated with decreased muscle function, respiratory function, immune function, quality of life, and impaired post-surgical wound healing. This causes an increase in the length of hospitalization, an increase in costs that must be incurred by the patient, and a high incidence or risk of complications during hospitalization. In surgical patients, poor preoperative nutritional status has been associated with postoperative complications, increased morbidity and mortality, such as the results of a study conducted by Cinda et al in 2013 where the prevalence of malnutrition in preoperative patients varied by type of surgery, from 4% in patients undergoing minor vascular surgery, up to 18% in patients undergoing major vascular surgery. Poor outcomes were also found in laparotomy patients admitted to the hospital with poor nutritional status. A significant relationship was found between nutritional status and postoperative complications, morbidity, and mortality (Kresnoadi, 2017).

Optimum nutrition is the main key for maintaining all phases of wound healing, there are two processes that can complement wound healing, namely activation of the stress response in the acute phase of the wound and energy and protein malnutrition that occurs. Providing nutritional support in the perioperative period can reduce complications, especially severe infections in malnourished patients. The higher energy expenditure for digestion and the loss of nutrients during enteral feeding must be balanced by the higher intake. The recommended energy intake is 110 - 135 kcal/kg/day during enteral nutrition. Meanwhile, recommendations for parenteral nutrition range from 90 to 120 kcal/kg/day. Higher calorie intake is important for infants with chronic diseases.

3.1 Insertion of nasogastric tube (NGT) as access for enteral therapy insertion of nasogastric tube (NGT) as access for enteral therapy

The feeding tube is usually selected based on the estimated duration of time needed, short-term therapy usually lasting less than four to six weeks through the use of a tube that is inserted through the nose or mouth with the end of the tube placed in the stomach, duodenum, or jejunum. Tubes used in the administration of enteral nutrition therapy are installed by trained doctors and nurses. Feeding directly through the abdomen is usually preferred because it allows for normal digestion and absorption. Nasogastric tube (NGT) tube installation is the most frequently used because it is more flexible and made of soft material and is smaller in size compared to other routes. Things that must be considered in the installation of a Nasogastric tube (NGT) tube, aims to ensure that the end of the tube enters the stomach, not into the lungs or esophagus. The things are as follows (1) Make sure the end of the NGT tube is in the stomach (2) Collection of gas that goes with the insertion of the tube into the stomach (3) Withdrawal of gastric fluid from the tube or radiographic confirmation that the end of the tube is properly inserted into the stomach stomach (Lubis & Suciati, 2016).

The main role of a nutritionist/dietist as a provider of enteral nutrition care is to choose the right enteral formula. The process of monitoring and evaluating patients on enteral nutrition does not only take into account medical diagnoses, but the main thing is to take into account the patient's needs. The following describes the composition of nutrients in enteral formulas, as follows, the maximum carbohydrate content in enteral formulas varies greatly when related to the proportion of other macronutrients that have been modified. Carbohydrate sources in enteral nutrition are

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diverse such as glucose oligosaccharides, malto dextrin, corn starch, sucrose, fructose. Lactose is no longer used because lactose intolerance is common in adult patients. The minimum amount of carbohydrate content in enteral nutrition is 30% (generally for diabetic patients) and a maximum of 80% in low-fat formulas (Munawaroh & Astutiningrum, 2012).

Generally, the protein in formula milk comes from soy seeds or casein. The amount of protein in enteral formulas varies widely, from <5% to >25% of calories. Protein in enteral nutrition comes from various sources, such as soy, casein, and egg albumin. Fat requirements in patients with enteral nutrition are 15-25 grams per day which are used for absorption of fat-soluble vitamins, and about 3-4% of calories come from linoleic acid which can prevent deficiency of essential fatty acids. The fat content in enteral formulas is often much higher than the minimum requirement, and corn oil and soybean oil are commonly used sources of fat.

TABLE 2.
Diagnosis of Patients with Enteral Nutrition

	Problem	Etiologi	Sign/symptom
NI-2.6	Enteral nutrition intake	Decreased consciousness and disturbances in consuming food by mouth	Insertion of a nasogastric tube (NGT), the patient received 1500 ml of enteral nutrition.
NI-2.1	Inadequate oral intake	Limited nutrient content in IV fluids	Intake (eg 340 calories without protein for 24 hours)
NI-5.2	malnutrition	Impaired utilization of nutrients related to malabsorption of nutrients, namely small bowel syndrome, infections	Mature; BMI less than 18.5 kg/m2. Children; failure to thrive, weight loss, loss of subcutaneous fat.
NI-5.1	Increased nutritional needs	Infection, medication, or medical or surgical procedure	Unwanted weight loss, eg >5% in a month.

Enteral nutrition is given to patients in the form of liquid food that has a liquid to thick consistency. This food is given to patients who have problems chewing, swallowing, and digesting food caused by decreased consciousness, high temperature, nausea, vomiting, post gastrointestinal bleeding, as well as pre and post surgery. Food can be given orally and enteral, the consistency of liquid food consists of three types, namely clear liquid food, full liquid food and thick liquid.

3.2 Relationship of nutritional status with wound healing of post-surgery patients

Nutritional status is an important factor during surgery, energy and protein malnutrition may be caused by illness and poor diet resulting in severe malnutrition. Energy and protein malnutrition will have an impact on physiological function and increase the risk of surgery or prolong recovery. The results showed that there was a relationship between nutritional status and wound healing in patients, because the nutritional status samples continued to improve, internal wounds were getting dry, and patients with good nutritional status had large reserves of nutrients, so that even though the surgical process occurred, the body still have energy reserves needed to restore lost nutrients and are able to accelerate wound healing (Prasetia et al., 2020).

The results of this study also showed that samples with poor nutritional status, then wet wounds, could permanently impede the postoperative wound healing process, this is in line with research conducted by Budiningsari and Hadi in 2008 where out of 66 surgical patients who suffered Mild malnutrition has a very fast cure rate significantly. Likewise, the results of a study conducted by Kay, et al in 2018, where out of a total of 41 orthopedic surgery patients, 94 of them had normal levels of nutritional parameters recovered without complications, while 44% of patients with poor nutritional status experienced significant delays in the healing process. The nutritional status of the patient is an important pre-surgery factor, while adequate and balanced nutrition will determine the nutritional status of the patient, it is strongly influenced by body systems including wound healing that occurs after surgery. Adequate nitrogen and fuel cell needs of the body can be carried out with good nutrition maintenance, because the type of surgery itself is

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closely related to a person's nutritional status after performing post-surgical activities (Purnomo et al., 2006).

The post-surgical nutrition screening was carried out with the aim of identifying factors related to malnutrition and the risk of undernutrition. Nutritional screening must be checked as valid, simple, easy to interpret and sensitive so that it can be widely used and consistently implemented by non-specialists. Several screening tools have been developed and validated, including self-reported indicators of risk or direct signs of poor or insufficient intake. If screening identifies a person at risk, they should be referred for a more detailed nutritional assessment. Nutritional assessment is a comprehensive process used to define a patient's nutritional status, beyond risk. This helps in measuring the risk of complications and can be used to plan and monitor nutritional support.

Patients with good nutritional status will respond better and recover faster from illness and surgery than patients with a history of poor nutrition. Several studies consistently show that 30-40% of patients show signs of malnutrition on admission to the hospital, and patients with sub-optimal and normal nutritional status decline during their stay in the hospital, thus, malnutrition factors will have a negative impact. clinically, as well as financially and quality of life in patients undergoing hospitalization, especially in postoperative recovery. An observational study that assessed nutritional status and its impact on pediatric surgical patients conducted by Sulistyaningrum & Puruhita in 2007 suggested that the better the BMI in a patient, the faster the postoperative wound healing process and the higher albumin, the faster the wound healing process. surgical wound healing. Meanwhile, the results of research conducted by Ijah in 2009 showed that there was a significant influence of nutritional status on wound healing and length of hospitalization, which was found from 39 perioperative patients in the surgical treatment room of the hospital. Dr. Wahidin Sudirohusodo, as much as 84.6% experienced a decrease in body weight (average decrease of 1.72 kg), and BMI (average decrease of 0.75 kg/m2).

3.3 Enteral nutrition

Enteral nutrition (EN) is nutrition given to patients who cannot meet their nutritional needs through the oral route, so that nutritional formulas are given through a tube into the stomach, nasogastric tube, or jejunum manually or with the help of a machine pump (gastrostomy and jejunum). percutaneous). The technique of inserting a tube to provide enteral nutrition was also described by Tuna et al in 2013 where in their research it was stated that there are several techniques for inserting a nasoenteric tube through the nasogastric, nasoduodenum, or nasojejunum, but it is preferable to use the PEG (Percutaneous Endoscopic Gastrostomy) technique because of the complications. less. Another technique that can be used is laparoscopic jejunustomy or gastrojejunustomy, but most patients are tolerant of manual insertion of a nasoenteric tube (Rennita & Hamidi, 2020).

The method of administering enteral nutrition itself can be done in two ways, namely gravity drip (administration using a funnel connected to a nasogastric tube at a speed following the force of gravity) and intermittent feeding (gradual feeding with a regulated speed using a syringe pump). effective compared to the gravity drip method, this can be seen from the mean value of gastric residue volume produced by intermittent feeding which is less than gravity drip, which is 2.47 ml : 6.93 ml. This is because a full stomach condition due to gravity drip administration will slow down gastric motility and cause gastric contents to become more acidic so that it will affect the opening of the pyloric sphincter, but the effect of a series of activities is permanent gastric emptying.

The residual gastric volume produced from enteral nutrition can reach 500 ml, this is still categorized as normal because it does not cause gastrointestinal complications and the diet volume ratio (diet given) in patients on ventilators with enteral nutrition has no effect on the production of gastric residual volume. Enteral nutrition should be given to all critically ill patients unless the patient has abdominal distension, gastrointestinal bleeding, diarrhea and vomiting. Enteral nutrition given to patients with gastrointestinal disorders can lead to inadequate nutrition and the risk of malnutrition (Munawwaro, 2018).

The results of another study regarding the use of enteral nutrition for critically ill patients were also presented by Jonqueira et al in 2012 where there is a protocol on nutrition for critical patients with an algorithm if the patient's hemodynamics has stabilized, firstly by calculating nutritional needs by choosing enteral nutrition. . The use of enteral nutrition can also improve the nutritional status of patients, this is in line with the results of a study conducted by Kim, Hyunjung

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et al in 2011 which showed that 48 ICU patients received adequate enteral feeding in the form of energy for 7 days, then the nutritional status of these patients increased when compared to patients who received enteral feeding below the need, during treatment with adequate enteral feeding there was a decrease in the value of Body Mass Index (BMI), prealbumin and Percent Ideal Body Weight (PIBW) (Yuniar et al., 2016).

Basically the provision of nutritional therapy is an important part in the management of pediatric patients after surgery, inadequate nutritional therapy is associated with increased morbidity and mortality, this situation is especially true in patients with long intensive care. The energy requirements of critically ill children are reduced for several reasons, such as the use of sedation and analgesics that decrease the basal metabolic rate, the energy required for minimal activity, and the state of severe metabolic stress. However, the majority of critically ill children exhibit a hypercatabolic state of protein, with consumption of high endogenous reserves, which can be minimized by an effective treatment plan.

In critically ill patients, nutrition is one of the therapeutic targets for children treated in the PICU, especially children who have experienced malnutrition or poor nutrition from the start. To meet nutritional needs, clinicians must take into account energy requirements and accompanying stress factors, calculate macronutrient administration, prioritize the oral or enteral route, especially if gastrointestinal disorders are not found. There is a difference between prescribing and providing nutrition due to complications so that enteral nutrition cannot be given. This causes underfeeding in children who are treated in the PICU and children are increasingly malnourished, to prevent malnutrition in children treated in the PICU, the calculation of calorie, protein, and fat needs must be carried out carefully, so collaboration between clinicians, nurses, dietitians, and pharmacy in a nutrition care team in critically ill patients (Mardiati et al., 2016).

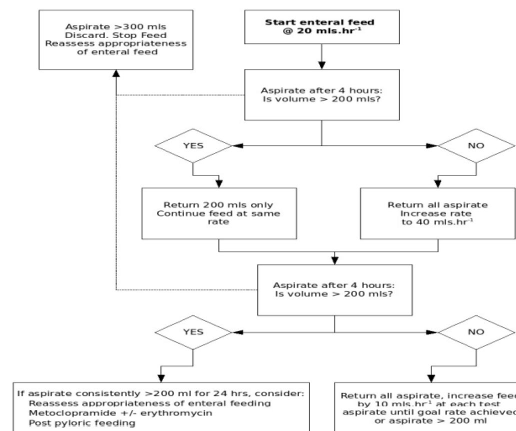

Figure 1. Algorithm for enteral nutrition

The results of this study showed that the group of children who were included in the early enteral nutrition group received enteral nutrition with a minimum number of calories 25% of the total calorie requirement per day in 48 hours of intensive care. Treatment of critically ill children receiving early enteral nutrition and delayed enteral nutrition for various reasons. This study did not investigate and further analyze the reasons for delayed enteral nutrition in patients. All study subjects were only categorized based on the basis of diagnosis and the number of comorbidities at the time of admission to intensive care, but the severity of the disease was not assessed (Nuraeni, 2009).

The characteristics of the two groups of study subjects based on age, sex, nutritional status, basis of diagnosis, number of comorbid comorbidities, and use of mechanical ventilators were not significantly different. The group of children who received early enteral nutrition had a length of stay of <7 days higher than that of late enteral. Based on the outcome, the group of children who received early enteral nutrition had a better outcome than the late enteral group. The results of this study are also in accordance with the Khorasani literature study conducted in 2009 where they reported that children who received early enteral nutrition had lower mortality rates, shorter length of stay, and less weight loss during

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postoperative intensive care.

4. Discussion

With such good acceptance of enteral nutrition, nutritional support that aims to achieve or at least maintain optimal nutritional status can be implemented because there is less food left, so enteral nutrition can be used as an alternative good nutritional support for children. Enteral nutrition is one way of giving food by inserting nutrients directly into the digestive tract using a feeding tube, besides that, alternative enteral nutrition can also be used because it is relatively safe for subjects who have the potential to experience nutritional disorders, so that the nutritional support provided can continue to run optimally. . In the end it can be concluded that the enteral nutrition given was accepted and well tolerated by the subjects. Enteral nutrition given in the postoperative period tends to give a good response to changes in nutritional status, prealbumin and serum albumin values tend to increase in most subjects and there is no weight loss.

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